POCKET COMPUTER NEWSLETTER

(c) Copyright 1983 POCKET COMPUTER NEWSLETTER

Issue 28 - October

Photo *Gavilan Mobile Computer with Revolutionary Touch Control Panel.*

Another *Personal Information*™ product.

GAVILAN READYING MOBILE COMPUTER

Gavilan Computer Corporation, of Campbell, California, is completing 18 months of development work on an exciting new highly portable "mobile" computer. Self-contained, and weighing just 9 pounds complete with batteries that will provide eight hours of operation, the unit is described by the firm as "a complete mobile office in a briefcase for executives and professionals." Measuring just 11.4 by 11.4 by 2.7 inches, the unit does indeed fit with room to spare inside a standard business briefcase.

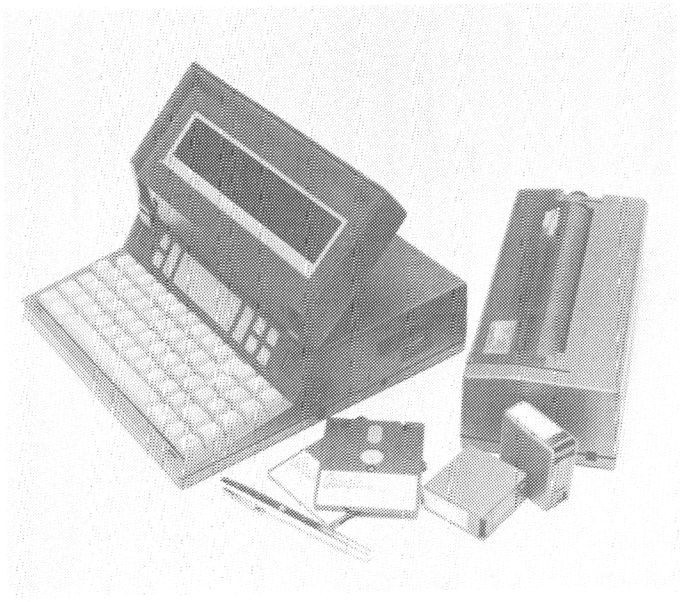
Photo *Gavilan and Printer Fit in a Briefcase.*

Perhaps the most exciting feature about the unit is the simplified human interface. The user commands the machine through an integrated touch panel which is described as a "solid state mouse." Merely touching a finger to this panel causes a pointer on the display screen to follow its motion. When the pointer highlights a desired choice, the operator just lightly taps the panel to invoke the selection. The ability to visually maneuver objects on the screen by using a single finger gives users the power to quickly become the system's boss.

The $3,995.00 basic system includes 32K of user RAM memory, 48K of system software, a built-in 3.5 inch floppy disk (320K formatted), a built-in modem, full keyboard and 10-key numeric pad, 8 line by 80 column LCD display, an external battery charger, and the revolutionary "finger mouse" panel. A strong complement of software is also supplied at no additional charge. A Gavilan operating system, 5 Gavilan application modules and the industry standard MS/DOS operating system are included. The Gavilan application modules, supplied on plug-in capsules that are about one-half the size of a package of cigarettes, include a spreadsheet, a forms processing data manager, word processor, communications controller, and a so-called "portable secretary."

The system can be expanded to include two disk drives, have up to 336 kilobytes of memory and may be equipped with a portable printer unit that weighs just five pounds. Other options include an accoustic coupler for communicating over standard telephone lines, a vehicle power adapter for operating the unit from a car, and plug-in memory expansion capsules that may contain 32 kilobytes of RAM, ROM, PROM or EPROM or combinations thereof. The capsules also hold their own lithium batteries which provide up to one year of RAM backup capability.

Photo *Gavilan Computer, Printer, Modules.*



The Software is Revolutionary

Working with computers can be a complex and frustrating experience, especially for beginners. The special human interface software and finger mouse built into the Gavilan mobile office makes using the computer easy for everyone. Here is how the system operates:

The user plugs a small module, called a capsule, containing the application program (actually on an integrated circuit) that he or she wants to use (or, alternately, inserts a microfloppy diskette into the built-in disk drive).

The user presses a "view" button on the control panel. This immediately causes a "desk-top" to appear on the screen. The desk-top uses icons, (symbols) and names to show the files and documents available to be worked on.

To indicate a selection from the desk-top, the user simply places a finger on the touch panel that is immediately beneath the display screen. Moving the finger along this panel causes a pointer to move on the display. When the pointer highlights the item wanted, a tap on the touch pad causes the document to be activated. It is not necessary to use cursor keys or memorize codes, document or file names in order to get the computer to operate.

The 8-line liquid-crystal display permits a data file to be easily scrolled left, right, up or down using scroll buttons on the control panel. There is also a system-wide command called *zoom* that is rather unique. It condenses an entire document so that it fits on the screen providing the user with an overview of the document's format. Any section of the document may then be accessed by using the finger mouse to move a "window" over the desired area and then tapping the control panel.

Help is available at any time from the computer itself rather than having to refer to a manual or instruction book. Touching the HELP button on the control panel invokes an overlay that presents four basic questions: What just happened? Where am I? What is this I am seeing? What do I do next? The finger-controlled pointer may then be used to select any of those questions for answering. The computer responds appropriately for the context. The system can also provide definitions of the function buttons and menu selections, if needed. The net result of this constant on-line assistance is that it is not necessary to carry along a user's manual or operating guide.

The Gavilan Capsuleware application programs provided with the unit are fully integrated. That means that the interface between the user and the programs operates similarly for all programs. As long as all the desired application modules are on-line (up to four capsules may be installed at one time), information may be transferred from one application to another. For instance, if the user is writing a financial report, spreadsheet values may be written directly into the text without having to load a separate program. Alternately, if the spreadsheet figures are updated, the corresponding figures in the text report will be revised automatically!

The five fully integrated application packages provided with the Gavilan mobile computer are briefly summarized as follows:

CapsuleWord -- provides full word processing capability including text editing, formatting and printing. Standard text or letters may be stored, recalled and modified. Features include global word search and replace, move/copy block, word, sentence and paragraph. Multiple fonts, page and paragraph formatting.

CapsuleCalc -- provides spreadsheets for laying out financial and other calculations, automatic recalculations, ability to include and print results in reports and other documents.

CapsuleOffice -- provides "to do" list, time recording, expense reporting, call reports, routes and schedules, appointments, tickler file and activity reports.

CapsuleComm -- provides ability to access commercial and proprietary data bases to inquire and select standard news, stock, library, events, airline schedules, hotel availability, games, corporate mail, etc. Allows communications between similar or dissimilar computers.

CapsuleForm -- provides the ability to design user-specific forms for data entry and printing. The fields associated with the form may be simply data entry fields or fields that are created as a result of arithmetic operations with other fields.

High-Powered Development Team

The Gavilan machine has been put together by an impressive development effort. Its design has been spearheaded by the founder and President, Manny A. Fernandez, who was formerly head of world-famous Zilog, Inc., of Z80 chip fame. F. John Zepecki, Vice President of Hardware Engineering, previously directed system development at Magnuson Computer Systems. John P. Banning, Ph.D., Vice President of Software Development, who also was a manager at Zilog, was instrumental in developing new computer architect for Amdahl Corporation in the past.

The development work has been fully supported by some 8.5 million dollars in venture capital financing and a 12 million dollar credit line with Bank of the West (of San Jose, California).

Competitive

The U.S. list price of $3995.00 complete with the Capsuleware software, the built-in floppy disk, communications modem, and the remarkable "finger mouse" control panel makes this an attractively priced unit. While priced modestly above a comparably equipped portable, such as the Sharp PC-5000, the highly integrated software, ease of use, compact size, and fact that the manufacturer is U.S. based, will likely make it highly attractive to many prospective portable computer users in the United States as well as elsewhere.

To obtain additional information write to: *Gavilan Computer Corporation, 240 Hacienda Avenue, Campbell, CA 95008.*

CASIO FX-802P INCLUDES PRINTER

Casio, Inc., 15 Gardner Road, Fairfield, NJ 07006, has recently introduced several pocket computers that sport a built-in 20-character thermal printer. Of interest to scientist and engineers is the model FX-802P. This unit is similar in most respects to a model dubbed the PB-300, except that it makes a number of transcendental functions available at the stroke of a special function key.

The unit weighs in at a reported 9.1 ounces with batteries installed. The printer section is powered by its own rechargeable nickel-cadmium batteries that can print about 3,000 lines per charge. The computer is powered by a pair a lithium cells that provide roughly 100 hours of operation. The PC measures 3/4 inch high by approximately 7 inches in width and 3-1/2 inches in depth. At this size it pretty well "stuffs" a pocket.

The 5 by 7 dot-matrix LCD display has 12 character positions for displaying text or numbers in 10-position signed mantissa format or 8-position mantissa, 2-digit exponent fashion. (All internal calculations are to 12 mantissa digits.) A total of 114 characters, including upper and lower case letters of the alphabet can be represented on the display. In addition, the display has individually controlled legends for indicating the status of the unit. These legends include: EXT, RUN, WRT, DEG, RAD, GRA, TR, PRT and STOP.

Fifty-five keys, including function and shift buttons, make up the ASCII encoded keyboard. Ten of the keys are arranged as a numeric keypad and are bordered by the most commonly used mathematical operators: plus, minus, multiply and divide. Alphabetical keys are arranged in standard typewriter QWERTY format. There is a large space bar at the bottom of the keyboard, which is unusual for a PC.

The unit is programmable in a version of BASIC that includes many functions such as square roots, powers, trigonometric and inverse trigonometric, logarithmic, exponential and generation of random numbers. User memory provides for 1,568 program steps and may be partitioned into 10 separate programs.

An excellent introductory BASIC programming manual is provided with the PC. This is a well written publication, not a stilted translation that sometimes accompanies imported PC models. There are about 15 simple program included in this publication. A second, more sophisticated manual of about 150 pages filled with applications programs is also included with the unit.

A rapidly expanding libary of programs is being made available on cassette tapes. These are loaded via the optional model FA-3 tape recorder interface.

The U.S. list price of the FX-802P is $150.00.

Photo *Casio FX-802P Pocket Computer with Built-in Thermal Printer.*

CASIO SOFTWARE MODULES

Casio has announced the availability of an entire series of programs on cassette for the FX-700P and FX-802P. The following is a list and brief summary of the capabilities of those said to be on the market. Casio claims more programs are under development.

Business/Finance

Travel Pak: Accumulate expenses in up to 10 categories. Prints out each entry and category totals. Organize travel expenses. $19.95.
Decision Evaluator: Computer will analyse your problem based on given variables. Output predicts your probability of success and control. $24.95.
Days & Dates: Calculates the day, date or calendar in the future or past. $19.95.
Financial Analysis I: A series of 9 programs may be used to calculate present and future values, annuities, periodic withdrawel and term of IRA investments. $24.95.
Financial Analysis II: Borrowing analysis using bank methods. Bankers and bank customers would use this program to calculate loan values, yielding same values as bank's computer. $24.95.
Mortgage Amortization: Determine payments of loan using amortized values. $29.95.
Mortage Analysis: Shows mortgage acceleration obtained by adding payments that reduce total payout. Also compares time payments to yield best mortgage value. $29.95.
Installment Sales Package: Calculates premiums related to the purchase of cars, houses, businesses, etc. $39.95.
Retail Sales Package: Tracks commissions, daily sales totals, product discounts. $19.95.
Matrix-Calc: Spreadsheet information from rows and columns is input and "what-if" variations may be made to obtain various outputs. $29.95.
Word Frame: General purpose filing system that allows sorting of long fields of data. $24.95.
Bank Package: Calculates loan values, early withdrawels, loan payments, penalties, etc. $39.95.
Auto Dealers Package: Calculates leasing rates, pricing of cars with loan variations, down payments and financing terms, etc. $39.95.
Real Estate Package: Calculates retail value of houses, buildings, businesses based on square footage. May be used on commercial or residential property. Calculates payments. $29.95.
Yardstick: Analyze sales performance against monthly and yearly sales goals/quotas. For sales people and management. $24.95.

Educational

Guess Again: Science, geography, trivia, history. An accompanying book gives the questions, the computer checks your answers. $14.95.
Alphabetizer: Learn alphabetizing. Store your favorite names in proper order. Presented in game form. $14.95.
Words: Hangman and word scrabble provide a way for children to learn as they play. $14.95.
Math for Kids I: Four different levels of difficulty for grade levels three through six. Randomly presented examples teach and test in one operation. $14.95.
Math for Kids II: More questions and higher difficulty levels. $14.95.
Scramble: Advanced word game helps teach spelling and tests powers of concentration. $19.95.
Understanding Inflation: Calculates value of money yesterday, today and tomorrow. Shows loan paybacks in terms of real dollars. $19.95.
Electronics: Learn principles of electronic calculations. Presents useful equations such as Ohm's Law, log functions, power calculations, etc. Can also be used in designing and solving electronic circuits. $24.95.

Games/Entertainment

Coder/Decoder: Secret code generator puts your message in a special code. Information is retrieved using your own password. $19.95.
Executive Decision Maker: The computer helps you with decisions. $14.95.
Game Pak 1: Vegas-type games - jackpot slots, Hi-Lo, Mindbender. $14.95.
Game Pak 2: Blackjack, dice games, golf and rocket game. Uses LCD computer graphics. $14.95.
Reflex: The computer tests your reactions. $14.95.
Puzzles: Cryptogram, assorted puzzles, thinking games. Used with accompanying booklet. $14.95.
Advanced Puzzles: Concentration and other board games to test your brain power. $19.95.

General Interest

Personal Finance: Checkbook, simple loans, calculation of monthly payments. $19.95.
Loan Analysis: General loan analysis, add-on interest, declining balance loans. $14.95.
Budget: Provides for twenty-two categories, shows under/over budget, year-to-date, adjusts budget to real spending, creates end-of-year report that may be used on income tax form. $19.95.
File: General purpose file system allows user to set up any file structure for phone numbers, products, names, etc. $24.95.
Biorhythms: Generates a chart of predicted good, bad and marginal days. $19.95.
Smart Shopper: Allows price versus quantity evaluation. Also useful for shopping, car loan, credit card payment comparisons. $24.95.
Coupon Clipper: Know what coupons you can use

by asking your computer. Tallies coupon values and tells how much is saved. $24.95.

Metric Converter: Converts between measuring systems. $19.95.

Score Keeper: Keep score on the golf course, at the ball game, playing cards, etc. Works with almost any kind of scoring game. $14.95.

Home Inventory: Maintain a computerized list of valuable items, serial numbers, date of purchase, value. $24.95.

Aviation: Complete flight package. Weight and balance calculations, general navigation, fuel consumption, flight time, drift angle, true air speed, corrected heading and more. Use the computer print out to fill out flight plan. $24.95.

Teachers Pet: Monitor class performance and that of individuals. Computer plots grade/performance curve. Data stored on tape for updating. $24.95.

Boot Strap: Compares tax-free investments versus self-funded non tax-free investments. Comparison shows real yield after taxes. $24.95.

Programming the FX-700P/FX-802P: Instruction book, data cassette and voice tape introduce programming. Examples in the book are followed by the computer. $29.95.

Advanced Applications and Concepts: Utility routines are provided and explained. Use as is or modified in your own programs. $29.95.

Math Frame: Flexible formula format allows variations in formula inputs. Results are then calculated. Up to three variables may be altered simultaneously. $24.95.

Base Conversion: Convert one base value to any other base (in the range 2 - 20) via base 10. Can be loaded with other programs. $19.95.

USING THE CE-158 (RS-232C) INTERFACE

Robert E. Fieux, P.O. Box 72, West Barnstable, MA 02668, has gained some valuable experience with the Sharp RS-232C interface (CE-158). This interface enables the Sharp PC-1500 or Radio Shack PC-2 to operate an external printer or to connect to a remote computer via telephone. This latter procedure permits linking into such networks as The Source or CompuServe. Many people feel the manual furnished with the CE-158 is difficult to understand. This article is intended to assist those who may have problems getting the RS-232C peripheral to operate. It is based on practical experience.

Compatability

When purchasing an RS-232C device, it is advisable to buy one of the same brand as your computer. Although the RS-232C ports on both the Sharp and Radio Shack are the same and will work interchangeably, the computer keyboards differ in layout. A keyboard template is provided with each brand-name RS-232C peripheral which is intended to fit the keyboard of the matching computer. If you cross brands, the template will not fit your computer keyboard. *[Note that while the RS-232C ports are identical, the Sharp unit provides an additional parallel port for directly driving a Centronics type printer. - N.W.]*

The RS-232C port will route information to a full-size external printer without additional accessories. However, if you wish to use the unit to communicate via telephone, you will also require a modem. The J-Cat Modem by Novation, Inc., will be discussed in this article.

Operating an External Printer

Connect the RS-232C device to your computer following the instructions in the manual, which are clear. Be sure your computer is turned off. Plug your printer into the top (parallel) connector. If you intend to use a modem, plug it into the RS-232C (bottom) connector. If you are using a J-Cat modem, be sure to make the connector pin change described on page 6 in Issue 24 of *PCN*. Always apply power to the computer first, then turn on the remaining peripherals.

The computer is only able to direct an external printer to output a line length of 74 characters. While a full line actually consist of 80 characters, the software uses some bytes for program line and print directions. The program permanently stored in the CE-158 ROM controls the length of the printed line as well as whether lines are single or double spaced. Other options are possible as discussed in the manual. The essential element in routing print instructions to an external printer instead of the CE-150 printer is the use of the command **OPN "LPRT"** with the computer in the RUN mode.

A Simple Word Processor

Switch to the PRO mode to type in the desired text. In this mode the computer is acting as a word processor. Each line must be numbered, as in writing a program, and each line number should be followed by a print command. For example, **LPRINT"** will cause the printer to start a line at the left hand margin. The command **LPRINT TAB 5;"** will cause the line to be indented five spaces.

These print command may be set up on the softkeys under one of the three Reserve Mode sections. To skip one line, as between paragraphs, use the command FEED 1.

For additional control over the printing layout, use the CONSOLE command. This command can only be issued after OPN "LPRT". When the PC is turned on, the default state of the CONSOLE command is 80,1. This means that the line length is set at 80 characters and lines are single spaced. For shorter lines, substitute the number desired in place of 80. To double space lines, issue the command CONSOLE 80,1,1.

When you are ready to print your text, switch to the RUN mode. Type RUN and press ENTER. (Be sure all peripherals are turned on and that you have entered the OPN "LPRT" command.)

Telephone Communications

Install the J-Cat modem according to the manufacturer's instructions (with the addition of the pin change mentioned earlier). When the modem is not in use, keep the Manual/Auto selector switch on Manual. If this is not done, the telephone may not receive normal incoming calls or be able to properly make outgoing voice calls.

Since everything is reset to default values when the PC is turned off, it is necessary to set up the computer for terminal operations each time you wish to use the communication facilities. I believe it is best to print the received data by dumping it from the receiving buffer (where it is stored as it comes in). Otherwise, the material will be lost when you end the terminal operation. This method also eliminates the problem of missing out on information that crossed the display too fast to be properly comprehended. The following initial entries should be made with the computer in the RUN mode in order to prepare the PC for terminal mode operation. (Conclude each directive by pressing the ENTER key.)

1. Enter OPN "LPRT".

2. Enter the CONSOLE command if line spacing is to be other than single spaced and 80 characters per line.

3. Enter the communications directive for the computer as follows: SETCOM 300,7,E,1. (Verify by entering COM$.)

4. Enter the printer control instruction as: SETDEV PO. (Check by entering DEV$.)

5. Enter TERMINAL to switch to the Terminal mode. (Do not enter the Terminal mode by using the DTE command as this appears to set the PC improperly.)

When the Terminal mode has been entered the display flashes the message:

ENTER MENU SELECTION

This is followed by:

Terminal: Ent Aut Quit

Now press the SHIFT key, then the scroll up key. A menu should appear on the LCD that reads:

Output: Ext Trc Dsp Etx

Press the softkey under Ext. The display will now query: EXT. PRINTER OFF? (Y/N). Type N and press ENTER to select the external printe. Then tap the scroll down key until the original menu (**Terminal: Ent Aut Quit**) appears again.

Press the softkey underneath Ent and the cursor (a dash) will appear on the LCD. This indicates that you are now in the Terminal mode and that the PC is ready to operate as a terminal. After setting the J-Cat modem appropriately, you may dial a distant computer.

To set up the J-Cat, place the selector switch on Automatic. Pick up the telephone handset and dial the number of a remote computer. After the normal ring tone, you should receive a connect tone which is usually a high-pitched steady whistle. When you hear this connect tone, press the Connect key on the J-Cat. This will produce a loud hum and both indicators should light. Hang up the phone.

You should now be able to receive messages from the computer you dialed. Additionally, messages that you type on your keyboard should be transmitted to the remote computer. If you are on a network such as CompuServe, follow their sign-on and operating protocols.

Dumping Received Data to a Printer

All of the data received from a remote computer goes into a buffer. (When the buffer overflows, the earliest data is dropped.) When you disconnect from the remote computer, but while still in the Terminal mode, you can recall the contents of the buffer by using the scroll keys. If you press SHIFT and the scroll up arrow, you will see the top line stored in the buffer. From this position you can dump all the data in the buffer to the printer. Just press the key marked PRINT on the template (softkey number three).

Exiting from Terminal Operation

When you want to exit the Terminal mode, press the BREAK (ON) key. The original Terminal menu will appear on the LCD:

Terminal: Ent Aut Quit

Press the softkey underneath Quit (F6) and the PC will return to the RUN mode.

Don't forget to set the select switch on the J-Cat back to Manual!

Once you have used this procedure a few times, go back and re-read the manual. You will probably find that many parts of it will become more understandable as you gain experience.

RS-232C INTERFACE PRINT FORMATTER

A limitation of the Radio Shack RS-232C Interface is the inability to change the 18 column, CSIZE 2 output format while in the Terminal mode. This can be particularly frustrating when dealing with numeric data formatted for 40 or 80 column printers because of the wrap-around feature. However, the data stored in RAM can eventually be accessed using BASIC. From there, it can be output to a printer in any CSIZE or format desired.

This program, provided by *Robert Stock, 304 Horseshoe Lane, Downingtown, PA 19335,* serves to simulate a print spooler. (A "print spooler" is a portion of a program that handles data as it is being prepared for output. It places the data into a buffer. On large computer systems the buffer is generally in disk memory.) The program permits scrolling through the data, forwards or backwards, by full and half screens or by single characters. The user may print at CSIZE 1 in the normal fashion. Alternately, "sideways" printing may be invoked at a 42 character width for CSIZE 2 or 84 character width using CSIZE 1. (The sideways printing routine is derived from Mel Beckman's *Sidelister* program that appeared in Issue 22 of *PCN*.) This program also enables the user to save and load data using cassette tape.

Program *RS-232C Print Formatter.*

```
10:" "TEXT :CSIZE
   1:INPUT ">>>?
   ";L$:GOTO L$
15:END
20:"SET"CLS :K=
   STATUS 2:GOTO
   10
25:"GO"CLS :WAIT
   0:PRINT "  ==>
    <<1 <13 <26 P
   RT SIDE"
30:F=ASC INKEY$ -
   16:IF F<1OR F>
   6THEN 30
35:CLS :GOTO 100*
   F
100:N=ASC INKEY$ :
   P=PEEK K
110:IF N=17THEN
   PRINT CHR$ P;:
   K=K+1
120:IF N=13THEN 25
130:GOTO 100
200:K=K-1:GOSUB 45
   0:GOTO 25
300:K=K-13:GOSUB 4
   50:GOTO 25
400:K=K-26:GOSUB 4
   50:GOTO 25
450:S=K:FOR J=1TO
   25
460:Q=PEEK S:PRINT
   CHR$ Q;:S=S+1
470:NEXT J:WAIT :
   PRINT CHR$
   PEEK (S+1):
   RETURN
500:P=PEEK K:
   LPRINT CHR$ P;
510:IF P=13THEN LF
   1:TAB 0
520:K=K+1:GOTO 500
600:INPUT "CSIZE =
    ? ";Z:CLS :X=
   212-Z*6
610:GRAPH :
   GLCURSOR (X,0)
   :SORGN :ROTATE
   1:CSIZE Z
620:X=0:L=0:C=0:M=
   0:GOTO 680
630:IF C>MLET M=C:
   IF M>(84/Z)LET
   M=84/Z
640:C=0:X=X-Z*10:
   GLCURSOR (X,0)
650:L=L+1:IF L=INT
   (20/Z)GOSUB 67
   0
660:RETURN
670:L=0:X=0:Y=-(Z*
   M*6.4):
   GLCURSOR (X,Y)
   :SORGN :M=0:
   RETURN
680:IF C>(84/Z)
   GOSUB 630
690:P=PEEK K:
   LPRINT CHR$ P;
700:IF P=13GOSUB 6
   30
710:C=C+1:K=K+1:
   GOTO 680
720:"SAVE"CLS :
   INPUT "Filenam
   e? ";F$:CSAVE
   MF$;STATUS 2,
   STATUS 3:GOTO
   10
730:"LOAD"CLS :
   INPUT "Filenam
   e? ";F$:CLOAD
   MF$;STATUS 2:
   GOTO 10
STATUS 1
                    766
```

Operating Instructions

Run the program by pressing DEF/SPACE. At the >>>? prompt, input SET and press ENTER to zero the spooler and initialize the printer. Alternately, type GO and press ENTER to see the Command Menu:

==> <<1 <<13 <<26 PRT SIDE

Select from the menu as follows:

Press F1 (==>) to scroll forward through the data in the buffer. Hold the F1 key down for continuous scrolling. Press ENTER to exit to the Command Menu.

Press F2 (<<1) to move backwards by one character. Press ENTER to return to the Command Menu.

Press F3 (<13) to move backwards by a half screen (13 characters). Press F4 (<26) to move back by a full screen. Either function may be terminated by pressing ENTER.

Press F5 (PRT) to print normally at CSIZE 1. This gives a 36 column format which is great for networks such as Compuserve, The Source or Dow Jones.

Press F6 (SIDE) to print sideways. Respond with a 1 or 2 to the prompt for CSIZE. A 1 will start the printer in an 84 column by 20 lines per page format. A 2 will print in a 42 column by 10 lines per page arrangement.

Once in the print mode (initiated by either F5 or F6), press BREAK to stop printing. DEF/SPACE may then be used to re-initialize the printer or re-run the program.

If you want to save data on cassette tape for future use, set up the recorder as if to CSAVE in the usual manner. At the >>>? prompt type SAVE and press ENTER. Respond to the prompt with an appropriate file name. Press ENTER at the end of the name to send date to the tape recorder. If the data buffer is not completely filled, listen to the audio sound made by the PC as the data is transmitted. When the sound becomes a steady tone, no more data is being sent. Press BREAK and then the CLear key to end the SAVE operation.

(When RAM is full, the tape SAVE operation will end automatically.)

To recover previously saved data, set up the recorder as if to CLOAD in the usual manner. At the >>>? prompt, type LOAD and press ENTER. Input the desired filename when prompted and conclude the name with the ENTER key. The data will be fed to the PC. If the file was made from a full RAM, then the loading operation will conclude automatically. Otherwise, a steady tone will indicate the end of data. Press BREAK and CLear to end the load operation when this tone is heard.

A Tip

If you use an acoustic modem, such as the Radio Shack Model AC-3, you can tap into the data going over the telephone lines. This can be accomplished through the use of an inexpensive in-line telephone pickup. Record the data on tape. The recorded data can then be played back through an earphone that has been mounted in foam rubber and inserted into the modem microphone cup. With the modem in the originate mode and the tape recorder volume set properly, the data can then be fed into the RS-232C interface. With the PC in Terminal mode, you can receive this data as though it was an actual telephone communication. Practically unlimited amounts of data can be stored on tape and played back as desired for viewing and/or printing!

FRACTIONAL BASE CONVERSION

Here is a program that will convert between binary, octal, decimal and hexadecimal. It does it without resorting to the use of double-digits (such as 10 and 15 in place of A and F). It has fractional

Program *Fractional Base Conversion*

```
 1:REM S.ETHERIDGE 6-83
10:PAUSE "  BASE CONVER
   TER W/F": CLEAR :
   DIM W$(1)*24,F$(1)*2
   4,T$(24)*2,D$(12)*2
20:INPUT "  BASE: ";B:
   INPUT "  CONVERT TO:
    ";C: INPUT "  NUMBE
   R: ";W$(1):L= LEN (W
   $(1))
30:FOR S=1 TO L:T$(S)=
   MID$ (W$(1),S,1): IF
   T$(S)="." LET R=S:S=
   L
40:NEXT S
50:IF R<>0 LET F$(1)=
   RIGHT$ (W$(1),L-R):W
   $(1)= LEFT$ (W$(1),R
   -1)
60:L= LEN (W$(1)):E=L:P
   =0:X=0:Y=0: GOTO 80
70:L= LEN (F$(1)):E=0:P
   =1:X=0:Y=1
80:FOR S=1 TO L:H=1
 90:IF P=0 LET T$(S)=
    MID$ (W$(1),S,1):E=E
    -1
100:IF P=1 LET T$(S)=
    MID$ (F$(1),S,1),E=S
    *(-1)
110:IF B<>8 THEN 130
120:IF T$(S)="8" OR T$(S
    )="9" LET S=L: GOTO
    10
130:IF B=16 GOSUB 330
140:X=X+ VAL (T$(S))*B^E
    : NEXT S
150:IF P=0 LET W$(1)=
    STR$ (X)
160:IF P=1 LET F$(1)=
    STR$ (X)
170:IF Y=1 THEN 200
180:GOTO 70
190:IF R<>0 THEN 140
200:W= VAL (W$(1)):F=
    VAL (F$(1)):A=W+F:
    IF C=10 LET W$(1)=
    STR$ (A): GOTO 320
210:L= LEN (W$(1)):W$(1)
    ="":X=0:Y=0: IF L=0
    THEN 250
220:X= INT (W/C):Y=(((W/
    C)-X)*C):W=X:H=2:T$(
    S)= STR$ (Y): IF C=1
    6 GOSUB 330
230:W$(1)=T$(S)+W$(1):
    IF W=0 THEN 250
240:GOTO 220
250:IF VAL (F$(1))=0
    THEN 320
260:W$(1)=W$(1)+".":M=
    LEN (F$(1)):P=M:X=0:
    Y=0
270:P=P-1
280:X= INT (F*C):Y=(F*C)
    -X:F=Y:H=2:T$(S)=
    STR$ (X): IF C=16
    GOSUB 330
290:W$(1)=W$(1)+T$(S):
    IF Y=0 THEN 320
300:IF P=1 AND X=0 THEN
    280
310:IF P<>-1 THEN 270
320:PAUSE "ANSWER BASE "
    ;C: PRINT W$(1):
    GOTO 10
330:IF D$(1)<>"" THEN 36
    0
340:IF H=1 LET I=1,J=12,
    K=1
350:IF H=2 LET I=12,J=1,
    K=-1
360:FOR D=I TO J STEP K:
    READ D$(D): NEXT D:H
    =0: RESTORE
370:IF T$(S)=D$(1) LET T
    $(S)=D$(2): RETURN
380:IF T$(S)=D$(3) LET T
    $(S)=D$(4): RETURN
390:IF T$(S)=D$(5) LET T
    $(S)=D$(6): RETURN
400:IF T$(S)=D$(7) LET T
    $(S)=D$(8): RETURN
410:IF T$(S)=D$(9) LET T
    $(S)=D$(10): RETURN
420:IF T$(S)=D$(11) LET
    T$(S)=D$(12): RETURN
430:RETURN
440:DATA "A","10","B","1
    1","C","12","D","13"
    ,"E","14","F","15"
```

capabilities. And, it does not require that you enter each digit separately.

Steven L. Etheridge, 14451 Tyler Street, Sylmar, CA 91342, submitted this program and adds the following general comments.

The program is designed to run on a Sharp 1250 or 1500. (It should do nicely on a Radio Shack PC-2 or PC-3.) To use the program, just load it and type the command RUN. Respond to the queries for the base (of the number you will be inputting), the "convert to" base and then the actual number that you wish to have converted. The number may be up to 24 characters and may be integer, fractional or a combination. (The limit of 24 characters includes the radix point!) That is all there is to it!

The program is broadly organized as follows:

Lines 10 & 20	Initialization and data input.
Lines 30 & 40	Scan for fractional number.
Lines 60 - 200	Convert input to decimal.
Lines 210 - 310	Convert decimal to final base.
Line 320	Display answer.
Lines 330 - 440	Hexadecimal translation.

The program only has a few error traps, due to the limited memory in a PC-1250. Those with a PC-1500 may want to add to the trapping that was included to catch the use of 8 and 9 while working in octal.

Program *Hexadecimal Loader.*

```
1000 REM  HEXADECIMAL LOAD PROGRAM
1010 INPUT "STARTING ADDRESS=?";S
1020 INPUT "HEX=?";H$
1030 IF H4="STOP"THEN STOP
1040 L=LEN(H$)
1050 IF L<>2THEN 1130
1060 D1=ASC(LEFT$(H$,1))
1070 D2=ASC(RIGHT$(H$,1))
1080 IF D1>64AND D1<71LET D1=(D1-55)*16:
     GOTO 1110
1090 IF D1>47AND D1<58LET D1=(D1-48)*16:
     GOTO 1110
1100 GOTO 1130
1110 IF D2>64AND D2<71LET D2=(D2-55)+D1:
     GOTO 1150
1120 IF D2>47AND D2<58LET D2=(D2-48)+D1:
     GOTO 1150
1130 PAUSE "WHAT?"
1140 GOTO 1020
1150 POKE S,D2
1160 S=S+1
1170 GOTO 1020
1180 END
```

HEXADECIMAL LOADER

William Delinger, Northern Arizona University, Department of Physics, Box 6010, Flagstaff, AZ 86011, submitted this program. It may be used to load information that is in hexadecimal notation directly into memory. While designed primarily for the PC-1500 and PC-2, changing the line numbers to a lower range should also make it useful to PC-1250 and PC-3 users who are dabbling with machine language.

METEORS GAME FOR PC-2/PC-1500

PCN rarely publishes games. However, we are making an exception for a submission by *David Hergert, 4714 Chickering Avenue, Cincinnati, OH 45232.* His combination BASIC and machine language (hybrid) program illustrates how ML routines can be called upon to enhance critical portions of a program. The program is elegant in its playing simplicity, yet can be rather challenging -- just try getting a perfect score (10 hits) when the game is set for its highest skill level (1).

To play the game, imagine that you are Captain of the spaceship that appears on the display. As you are traveling along you suddenly encounter a meteor shower. There are 15 meteors in the shower but you only have 10 laser-missiles with which to defend yourself. (You have learn to judge which meteors will probably miss your craft!)

Once the program has been loaded, use a RUN command to start the action. Respond to the skill level query according to courage. Level 4 is for beginners. Level 1 brings on the meteors at their fastest rate. Watch out! Any meteor landing a solid hit on your spaceship ends the game. A successful mission on your part, brings a visual reward.

If you want to do some tinkering with the program, variable G in line 40 controls the display time of the laser. The laser firing is displayed via a ML routine that uses an exclusive OR instruction to invert the center row of dots. Line 190 of the BASIC program calls a ML counter that displays the contents of the accumulator for a short amount of time.

Good luck, Captains!

Program *Meteors*

```
10:POKE &47C0,&48
   ,&76,&4A,&0,&5
   ,&BD,&88,&41,&
   4E,&4E,&99,&8,
   &4C,&77,&8B,&6
20:POKE &47D0,&48
   ,&77,&4A,&0,&9
   E,&12,&9A,&FD,
   &6A,&FD,&A8,&C
   D,&10,&80,&FD,
   &2A
25:POKE &47E0,&62
   ,&6E,&01,&81,&
   07,&FD,&A8,&CD
   ,&10,&80,&9E,&
   E,&9A
27:WAIT 50:PRINT
   "PRESS + TO FI
   RE"
30:INPUT "ENTER S
   KILL LEVEL(1TO
   4) ";M:CLS
40:S=0:W=0:P=0:G=
   50
50:A=1:Z=((RND 6-
   1)/2+1)*10
60:WAIT M:P=P+1
70:FOR C=155TO 6
   STEP -Z
80:GCURSOR 0:
   GPRINT "08080C
   0C1E1E3F1E1E0C
   0C0808"
90:IF P=16THEN 27
   0
100:GCURSOR ABS (C
   -1):GPRINT A;A
110:IF INKEY$ ="+"
   AND S<10THEN 1
   80
120:GCURSOR ABS (C
   -1):GPRINT 0;0
130:A=A*2:IF A=128
   THEN 50
140:NEXT C
150:WAIT 50:
   GCURSOR 3:
   GPRINT "412241
   08412241"
160:CLS
170:GOTO 250
180:CALL &47C0
190:CALL &47D7,G
200:CLS :S=S+1:IF
   A=8THEN 220
210:GOTO 80
220:GCURSOR 0:
   GPRINT "08080C
   0C1E1E3F1E1E0C
   0C0808"
230:WAIT 50:
   GCURSOR C:
   GPRINT "412214
   08142241"
240:CLS :W=W+1:
   GOTO 50
250:WAIT 100:PRINT
   "YOU HIT ";W;"
    METEORS."
260:CLS :GOTO 30
270:CLS :WAIT 0
280:FOR X=1TO 155
290:GCURSOR X:
   GPRINT "000008
   080C0C1E1E3F1E
   1E0C0C0808"
300:NEXT X
310:WAIT 50:PRINT
   "YOU MADE IT!"
   :GOTO 30
STATUS 1        829
```

FROM THE HIP POCKET

Our readers write to share information with others.

Time

The Sharp PC-1500/Radio Shack PC-2 TIME function is a good calendar clock. But it may take a moment or two to interpret a display like 70403.0017 at 3 AM or when there are distractions. One remedy is to use the Instruction Manual's clock simulation program. But it is a nuisance to type this program back in each time after one has deleted a long program using NEW.

A better remedy is also an interesting example of the sort of small program that can be executed via Reserve keys. Program any two adjacent Reserve keys as follows:

```
Left:  Z=(INT(TIME*100+.7)-INT(TIME/100)*1E4)/
       100
Right: PRINTUSING"###.##";"Date =";INT(TIME/
       100)/100;"  Time =";Z-12*INT(Z/13)
```

(The use of .7 instead of .5 in the first INT expression is not a misprint. With the one exception that is mentioned below, it rounds base-60 minutes and seconds properly for a base-10 display.)

Pressing LEFT alone gives the time, but a time such as 2:10 PM will appear as 14.1. Pressing LEFT then RIGHT gives a properly formatted date and modulus-12 time. For instance, at 2:10 PM on July 4th the display would read:

Date = 7.04 Time = 2.10

There is one minor bug. Whenever the time is 30 or more seconds past 59 minutes after an hour, screen output will display that hour and 60 minutes instead of the next hour (3.60, for instance, instead of 4.00). Unfortunately, the programming also uses up most of the reserve area memory, so that eliminating this bug requires simplifying the display. Use three Reserve keys:

```
Left:  (As above)
Next:  Z=Z+.4*(Z-INTZ=.6)
Right: PRINTUSING"###.##";"D";INT(TIME/100)/
       100;" T";Z-12*INT(Z/13)
```

I prefer the first program.

Arthur L. Thomas
University of Kansas
307 Summerfield Hall
Lawrence, KS 66045

I/O Ports

I have found the handshake signals of the CE-158 serial interface make convenient one-bit input and output ports for the Sharp PC-1500.

The example provided here uses the Request-To-Send (RTS) signal from pin 4 on the RS-232

connector. This pin is connected to a diode and a 2.2K resistor and then to a solid state relay as shown in the accompanying diagram. In this way the low voltage output of the PC-1500 can be used to control a 110 V.A.C. device. The BASIC command OUTSTAT 0 will turn the relay on and the command OUTSTAT 2 will turn it off. Or, equivalently, these values may be POKEd at hexadecimal location D00E in the alternate memory of the PC. Machine language commands may also be used to control the relay.

As indicated in the diagram, the output from pin 4 on the RS-232 connector is used to control the solid state relay. A suggested relay is the Crydom Model D2402 (priced at about $16.00 at Newark Electronics). This relay will control A.C. currents up to 2.5 amperes. With the arrangement shown, about 1.6 milliamperes is drawn from the CE-158 interface when the potential difference at the D.C. input to the relay is about 3.6 volts. This current is well below the limiting value of the SN75188 driver chip in the interface, which is approximately 10 milliamperes.

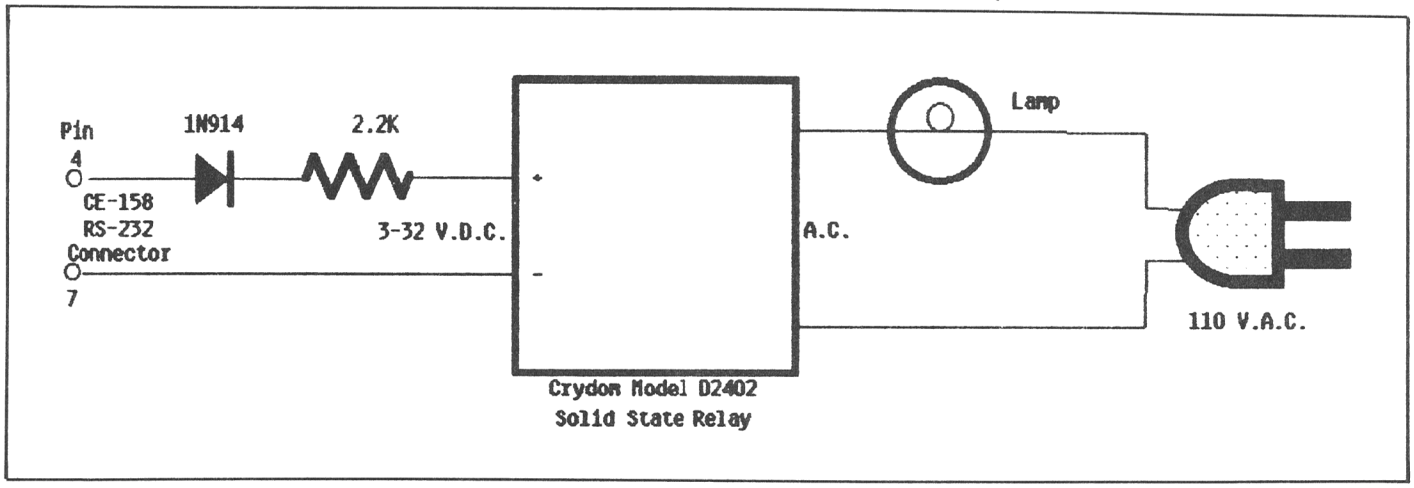
The BASIC program is a simple example illustrating that the latched port can be used to turn on a 110 V.A.C. light after an elapsed time. The first three lines of the program prompt the user for the hour, minute and second. The program then goes into a loop and will turn on the light at the requested time. Of course, a more sophisticated type of control program could be written, but this illustrates the method.

```
 10 : INPUT "HOUR=?";H
 20 : INPUT "MINUTE=?";M
 30 : INPUT "SECOND=?";S
 40 : CLS
 50 : C=10000*H+100*M+S
 60 : A=TIME/100
 70 : B=(A-INT(A))*1000000)
 80 : IF B=C THEN OUTSTAT 0:STOP
 90 : GOTO 60
100 : END
```

I have also used this general scheme to run a stepper motor. Similarly, other signals can be input or output to connect the PC with the outside world.

William G. Delinger
Northern Arizona University
Department of Physics
Box 6010
Flagstaff, AZ 86011

Diagram *Solid State Relay, Controlled by RS-232C Port, Activates Lamp.*



ALTERNATE CONTROL OF THE PC-1500 LCD

The liquid-crystal display (LCD) on the Sharp PC-1500 and Radio Shack PC-2 consists of 156 columns by 7 rows for a total of 1092 points or pixels. If you have studied the Instruction Manual, then you know that one way to access individual pixels is to use the GCURSOR and GPRINT statements. The GCURSOR directive will select the starting "column" while GPRINTprovides for the turning on (or off) of selected dots within a column.

Selecting a particular column is not difficult because the GCURSOR parameter allows this to be directly specified: GCURSOR 10 directs the PC to start displaying in column 10 (with the first column being referred to as column zero).

Selecting a particular row within a column can be somewhat more complicated. Rows are numbered from top to bottom, starting with row zero. Rows are assigned values according to a binary positioning scheme. The top row (row 0) is activated with a value of 1. The next row (row 1)

needs a value of 2, the next (row 2) requires the value 4, and so forth. This continues down to the seventh row (labeled row 6) which is activated by a value of 128. Note that this is 2 raised to the 7th power. Dealing with this kind of scheme can become complicated for anyone, never mind just beginners.

For instance, what do you do if you want to, say, turn on a single pixel *without disturbing any of the other points* within a column? You cannot just blindly invoke the GPRINT statement (even if you have figured out how to easily turn on the desired row position), for to do so will knock out whatever else was already activated in that column.

Well, there is also a POINT statement in the PC's repertoire. It can be used to find out what points within a column are activated at any given time. So, you use it. What do you get back? Why a value. Properly decoded it will tell you what points are turned on. Now what? You have to do something that will preserve those points while also turning on the pixel that you want to put up at the present time. Have you figured out a way to do it?

```
5900 "GR"WAIT 0
5910 E=POINT X:D=
     (2^Y):D=DOR
     E
5920 GCURSOR X
5930 GPRINT D
5940 RETURN
```

The variables X and Y in the above subroutine are the LCD matrix points (column number going from left to right starting at zero, row number going from top to bottom, starting at zero). Variable E is used to temporarily store the current contents of column X as retrieved by the POINT statement. The little trick of raising 2 to the power of Y (where Y is the desired row in the range 0 to 6) yields a value that turns on a single pixel within a column. This value, representing a single point, is retained in variable D and then logic-ORed with the contents of E. The result is whatever was already in the column with pixel Y also being on (if it wasn't already). The GPRINT D directive throws the whole thing back up on the screen.

Thank you, but I don't feel that little routine is non-trivial or very obvious to those that have not been around programming for awhile. The gist of what I am saying is that using LCD graphics in many types of applications can hardly be called a snap on the PC-1500.

Ah well, one can always learn, right? That is what this little spiel is about. Just to make sure you are with me, you can couple the little subroutine just presented with the following series of directives and do some experimenting.

```
100 INPUT "X-COORD
    : ";X
110 INPUT "Y-COORD
    : ";Y
120 CLS:GOSUB "GR"
130 A$=INKEY$:IF
    A$=""THEN 130
140 GOTO 100
```

With the PC in the RUN mode, you may enter X coordinates (in the range 0 - 155) and Y coordinates (0 - 6) in response to the prompts. You will then see a single dot appear on the screen at the position selected. Play around for awhile until you become a believer and are in sync with the coordinate grid being used. (The X axis goes the same old way. The Y axis has increasing values going down, which may perturb you a bit if you are not used to dealing with computer graphic displays. Never mind, you will get used to it!)

Exciting, huh. You can put a whole dot at any position you want on the display....

But, A String of Dots....

Makes a *line!* So, when you feel up to it, add in the next couple of routines to your growing library:

```
200 INPUT "X1-COOR
    D: ";R
210 INPUT "Y1-COOR
    D: ";U
220 INPUT "X2-COOR
    D: ";S
230 INPUT "Y2-COOR
    D: ";V
240 CLS :GOSUB "LI
    NE"
250 A$=INKEY$ :IF
    A$=""THEN 250
260 GOTO 200
5000 "LINE"IF S>R
    LET P=1
5010 IF S<RLET P=
    -1
5020 IF S=RTHEN 5
    070
5030 FOR M=RTO S
    STEP P
5040 Y=INT ((((V-
    U)/(S-R))*(M
    -R))+.5)+U
5050 X=M:GOSUB "G
    R"
5060 NEXT M
5070 IF V>ULET O=
    1
5080 IF V<ULET O=
    -1
5090 IF V=UTHEN 5
    140
5100 FOR N=UTO V
    STEP O
```

```
5110 X=INT (((N-U
     )*(S-R)/(V-U
     ))+.5)+R
5120 Y=N:GOSUB "G
     R"
5130 NEXT N
5140 RETURN
```

Note that the variable at the end of lines 5070 and 5080 (and the STEP value in 5100) has the name "O" (as in "Oh, my goodness!"). Don't go crazy trying to redefine the value zero.

When you have those routines installed, you can use the command RUN 200 to give your new capabilities a whirl. Respond to the queries for X1,Y1 and X2,Y2 coordinates as the beginning and ending points of a line on the LCD. Press ENTER after inputting Y2 and you should see your little PC laboriously draw a line between the points you specified. I say laboriously, because the process is rather slow. Never-the-less, chances are you haven't seen the likes of that before on your PC. If you do some experimenting, you will discover that the line can go from left to right or right to left or down to up and vice-versa or straight across, etc. You can now draw any straight line you want, just give the start and end coordinates. (Yeh, I know you could do that on the printer, but had you done it on your LCD?)

When you get tired of inputting coordinates to see your little machine draw lines, you can create your own line doodler with these lines of code:

```
300  CLS
310  R=RND (155)+1:
     S=RND (155)+1:
     U=RND (6)+1:V=
     RND (6)+1
320  GOSUB "LINE"
330  GOTO 310
```

Executing RUN 300 will send the PC off on the task of filling up its screen with lines. Remember, this routine is only turning points on, not off, so any time it intersects with a previously drawn line you won't see anything happen. After awhile you won't see much of anything going on because the screen will be filled with overlapping lines. Of course, then you can press BREAK and start the process all over again.

When you have had enough of that, you can get to work thinking of some practical applications for the line drawing routine. If, that is, you can tolerate the snail's pace at which it operates. (Of course, sometimes slow is a lot better than nothing at all!)

You Can Stop Here

If you don't want to learn any more about how the LCD really operates. The going starts to get a little rougher....

While what has been presented certainly works, it sort of lacks something -- mainly speed! If we are going to go on to see if this problem can be surmounted, then it will be necessary to get right down to the real nitty-gritty of how the LCD is controlled on a pixel-by-pixel basis. (That's right, we are heading toward machine language routines. If that turns you off, you should have stopped when given the opportunity!)

The liquid-crystal display is always controlled by the contents of a particular block of RAM. Precisely, the locations from &7600 - &764D and &7700 - &774D. These are the locations that control the individual pixels. (Two other memory locations, &764E and &764F control the LCD legends. Those are the little indicators that say RUN, BUSY, DEG, etc. This discussion will not be concerned with the control of those signs.)

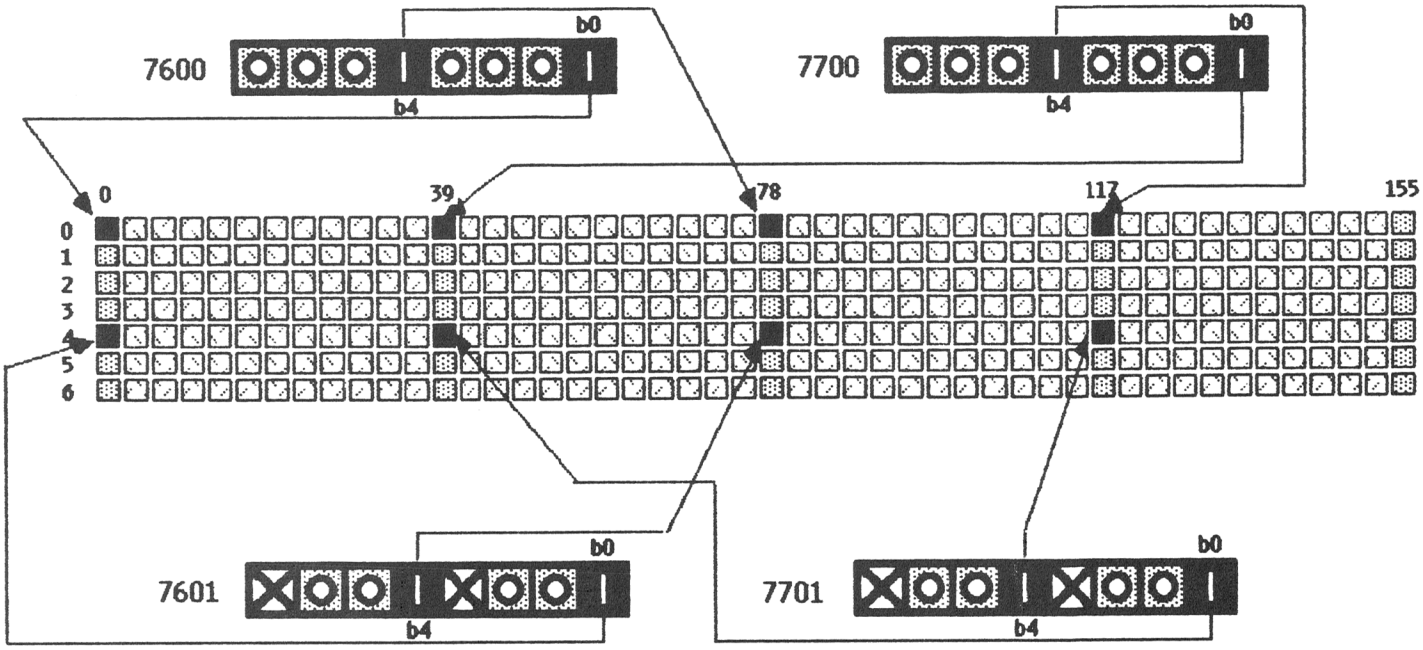
Alas, the correlation between the controlling locations in memory and the points on the display is not exactly what one would call a straightforward transformation! A more likely terminology would be piece-wise linear -- with a lot of pieces!

Now it starts out easy enough. Using the coordinate system previously defined for pixels in the LCD, location 0,0 is controlled by the contents of bit 0 (the least significant bit) in the byte of memory that resides at the address &7600.

It doesn't stay neat for very long. Bits 1, 2 and 3 of that memory location do control pixels in rows 1, 2 and 3 of column zero on the display. But, does bit 4 control row 4? Noooo! What is controlled by bit 4 at address &7600? Would you believe *row 0 in column 78?* Believe it. And where on earth is the memory location that controls cell 4 in column 0? How about the zero bit in the next memory address at &7601? Well, that's the way it works.

The scheme is somewhat illustrated by the accompanying diagram. There is a pattern to it, but it will seem pretty obtuse to those uninitiated in the craft of computer design. The gist of the layout is: the lower-half bytes of even-valued memory addresses in the range &7600 - &764C control the pixels in the zone X=0 to X=38 and Y=0 to Y=3, the lower-half even-valued addresses from &7700 - &774C control pixels in the zone X=39 to X=77 and Y=0 to Y=3, the upper-half bytes of even-valued addresses &7600 through &764C dictate the status of pixels in the range X=78 to X=116 and Y=0 to Y=3, the upper-half bytes of even-valued locations &7700 - &774C relate to the LCD cells in the range X=117 through X=155 with Y=0 to Y=3, the three lowest-ordered bits of the bytes having odd addresses in the range &7601 - &764D control row points 4 to 6 (that is, Y=4 to Y=6) in the range X=0 to X=38 (note that bit position b3 is not used in the odd-valued address bytes), similarly the lower

Diagram *Memory Locations That Control Individual LCD Pixels.*



three bits of the odd addresses in the range &7701 - &774D control pixels in the range X=39 to X=77 with Y=4 to Y=6, while the upper-half of bytes (with bit b7 unused) in the odd-valued addresses in the range &7601 - &764D evoke responses in the range X=78 to X=116 and Y=4 to Y=6, and similarly the upper-half bytes (b7 not used) of odd addresses from &7701 through &774D control pixels having the coordinates X=117 to X=155 and Y=4 to Y=6.

Whew. Behold the diagram for clarification. (Oh yes, the diagram is compressed horizontally, so that not every column is shown. OK?) The following routine can be used to verify our understanding of these matters:

```
1000 "ON"A=&7600:
     B=256
1010 "COL"F=0:IF
     X<39LET C=A+
     X*2:GOTO "RO
     W"
1020 IF X<78LET X
     =X-39:C=A+B+
     X*2:GOTO "RO
     W"
1030 F=1:IF X<117
     LET X=X-78:C
     =A+X*2:GOTO
     "ROW"
1040 X=X-117:C=A+
     B+X*2
1050 "ROW"IF Y<4
     GOTO "FLG"
1060 C=C+1:Y=Y-4
1070 "FLG"IF F=1
     LET Y=Y+4
1080 E=PEEK C:D=(
     2^Y):D=DOR E
1090 POKE C,D
1100 RETURN
```

All this routine really does is give us another way of controlling the individual pixels of the LCD. You can substitute it for the first subroutine (labeled "GR") that was presented near the start of this discussion. Just change the references to "GR" in lines 120, 5050 and 5120 to "ON" to incorporate this new subroutine. Try it out using the entry routines (RUN 100, RUN 200 or RUN 300).

You may not be all that thrilled at this point. The speed of this routine seems to be about the same as the GCURSOR/GPRINT method. What has been gained? Little more than understanding, hopefully, at this juncture. But, at least now we have a method of dealing with those little pixels *that correlates with locations in memory.*

That means we are in a position to start working directly in machine language if it appears that it might do us some good. If speed is a criteria, then there is no doubt that MLP (machine language programming) could serve us in good stead. How would you like to see any line you wanted drawn on the LCD in a fraction of a second?

That shall be the goal of the next installment. In the mean time, perhaps you will want to try your hand at converting the above "ON" subroutine to machine coded directives. Challenging?

FROM THE WATCH POCKET

Hope you like our new 16 page format. It will enable us to broaden our scope somewhat. We plan to keep a closer eye on some of the PC models that seem go be gaining in popularity, such as the new Casio models. And, in response to popular requests, we will be tracking the introduction of some of the compact notebook and briefcase computers that offer substantial capability.

Speaking of the latter, I am most impressed with the operating system that is being touted for the Gavilan. This type of system, particularly when implemented in a manner such as theirs, makes it very easy for anyone to use the machine. One of the biggest drawbacks to dealing with a computer on a regular basis is having to organize all the data. By that I mean having to remember which files are on what diskette, what data is in which files, what files relate to one another, and so forth.

Up until recently, the user was forced to do a good portion of this organizing mentally. You had to devise a file naming system that would (you hoped) help you recall what you were dealing with as you used the computer. For instance, you might name a word processing file "Jones:ltr." If you also had a spreadsheet document associated with the information you provided in the Jones letter, you might call it "Jones:calc." A third file for your data base program might be named "Jones:info."

The problem comes in when the number of such documents you may be dealing with mounts into the hundreds. It soon becomes a chore just turning the computer on and mentally struggling to recall all the file relationships, names, etc. Sure, menu and catalog systems help. But, unless the software is fully integrated, you can't even tell, for instance, that the Jones letter refers to another spreadsheet file and/or entries in another data base.

A fully integrated system such as the Gavilan greatly relieves the mental strain associated with using a computer. Pictorials of files, folders and documents, are arranged so that they intrinsically show you the organization of a project. At a glance you can see that a "folder" contains a letter, a spreadsheet and a list. Then you need simply "point" to the image of the folder using the touch control panel to tell the computer that you want to work with its contents. Another touch (pointing to, say, a "letter" document that is within a folder) and you are ready to modify the document.

There can be little argument that merely pointing a finger and tapping a screen to make a selection from a graphically organized menu sure beats having to recall and type something such as: CATALOG, LOAD JONES.LTR, EDIT. Repeated tens and hundreds of times during a working day, the latter method becomes a joke (and even a cruel one) in comparison.

A Plug

If you are interested in keeping up with the "desktop" computer scene without having to read a dozen magazines a month, I can recommend the **Jeffries Report,** *Box 6838, Santa Barbara, CA 93111,* phone (805) 967-7167. This 8-page monthly newsletter is tightly written by Ron Jeffries (who also bylines a number of magazine columns). He does a good job and makes interesting reading. It is one of the better industry newsletters I have seen over the years. Current subscriptions are $30.00 for 12 issues. No kickback involved here, just genuine respect.

Thank You!

As many of you know, *PCN* periodically surveys a randomly-selected sample of its readership. The results of these polls are used to provide guidance as to the type of material you wish to see. To those of you who have responded in the past and to those who may be asked to do so in the future, I wish to extend a sincere "Thanks!".

By the way, if you have material you believe might be of interest to other *PCN* readers, write for a copy of our *Author's Guidelines.* It provides a brief outline of our article review policy, desired manuscript format and payment rates.

Available Only by Prepaid Subscription for a Calendar Year Period (January - December). You are sent back issues for the calendar year to which you subscribe, at the time you enroll.

MC/VISA Phone subscriptions: (203) 888-1643

__ I am interested. Please send more information. I have:
__ a Sharp PC-1500 __ Radio Shack PC-2 __ ?_____

__ Enroll me as a 1984 Subscriber (Issue numbers 31-36). $18.00 in U.S. ($21.00 to Canada/Mexico. Elsewhere U.S. $30.00 payable in U.S. funds against a U.S. bank.)

__ Enroll me as a 1983-84 Subscriber (Issue numbers 21-36). $54.00 in U.S. ($63.00 to Canada/Mexico. Elsewhere U.S. $80.00 payable in U.S. funds against a U.S. bank.)

__ Enroll me as a 1982-84 Subscriber (Issue numbers 11-36). $78.00 in U.S. ($95.00 to Canada/Mexico. Elsewhere U.S. $120.00 payable in U.S. funds against a U.S. bank.)

__ Check here if paying by MasterCard or VISA. Please give credit card information below.

Orders must be accompanied by payment in full.

Name: _____

Addr: _____

City: _____ State: ____ Zip: _____

MC/VISA #: _____

Signature: _____ Exp. Date: _____

POCKET COMPUTER NEWSLETTER
P.O. Box 232. Seymour. CT 06483